

FORM PTO-1390 (Modified)
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

112740-262

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/936444

INTERNATIONAL APPLICATION NO.
PCT/DE00/00761INTERNATIONAL FILING DATE
10 March 2000PRIORITY DATE CLAIMED
11 March 1999

TITLE OF INVENTION

METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED COMMUNICATION NETWORK

APPLICANT(S) FOR DO/EO/US

Werner Stockl et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
- ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
- ☒ A copy of the International Search Report (PCT/ISA/210).
- ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
- ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
- ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
- ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Submission of Drawings - Figures 1-4 on four sheets

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/936444)	INTERNATIONAL APPLICATION NO. PCT/DE00/00761	ATTORNEY'S DOCKET NUMBER 112740-262
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21. The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :					
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,000.00					
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00					
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00					
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	9 - 20 =	0	x \$18.00	\$0.00	
Independent claims	1 - 3 =	0	x \$80.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$860.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>				\$0.00	
SUBTOTAL =				\$860.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL FEES ENCLOSED =				\$860.00	
				Amount to be: refunded	\$
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☒ A check in the amount of **\$860.00** to cover the above fees is enclosed.

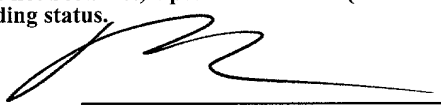
☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
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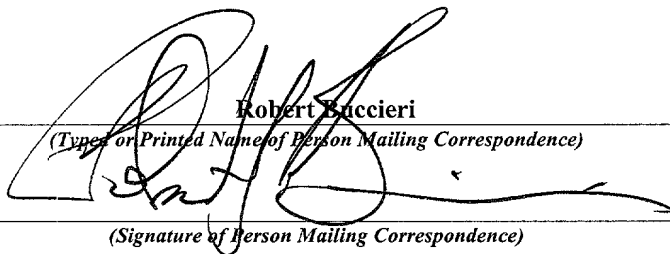
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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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Robert M. Barrett
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30,142
 REGISTRATION NUMBER
September 11, 2001
 DATE

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): Werner Stockl et al.			Docket No. 112740-262	
Serial No. 1935444	Filing Date	Examiner	Group Art Unit	
Invention: METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED COMMUNICATION NETWORK				
<p>I hereby certify that the following correspondence:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> Transmittal letter to the United States Designated/Elected office in duplicate, International application as filed, amended pages, English translation, amended pages, Preliminary Amendment, Submission of Drawings Figures 1-4 on four sheets, IDS, PTO 1449, references, search report, executed declaration and power of attorney, filing fee \$860.00, postcard (see enclosed envelope for executed assignment and fee) </div> <p style="text-align: center;"><i>(Identify type of correspondence)</i></p> <p>is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for Patents, Washington, D.C. 20231 on</p> <div style="display: flex; justify-content: space-between; align-items: flex-end; margin-top: 20px;"> <div style="width: 30%;"> <p><u>September 11, 2001</u></p> <p><i>(Date)</i></p> </div> <div style="width: 60%; text-align: center;">  <p>Robert Bucciari <i>(Type or Printed Name of Person Mailing Correspondence)</i></p> <p><i>(Signature of Person Mailing Correspondence)</i></p> <p>EL647240535US <i>("Express Mail" Mailing Label Number)</i></p> </div> </div>				
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IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS: Werner Stockl et al. DOCKET NO: 112740-262
SERIAL NO: GROUP ART UNIT:
EXAMINER:
INTERNATIONAL APPLICATION NO: PCT/DE00/00761
INTERNATIONAL FILING DATE: 10 March 2000
INVENTION: METHOD FOR DATA TRANSMISSION VIA A PACKET-
ORIENTED COMMUNICATION NETWORK

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the
National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In the Specification:

Please replace the Specification of the present application, including the Abstract,
with the following Substitute Specification:

S P E C I F I C A T I O N

TITLE OF THE INVENTION

**METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED
COMMUNICATION NETWORK**

BACKGROUND OF THE INVENTION

The present invention relates to a method for data transmission between the two
communications devices via a packet-oriented communications network. In particular, the
present invention relates to a transmission system for transmission of timeslot-oriented data
between an exchange termination device, frequently referred to as an exchange termination
ET, and a line termination LT. According to the terminology of ITU-T Standard G.960
(3/93), "access digital section for ISDN basic rate access" (International Telecommunication
Union), in particular pages 2 and 3, the present invention accordingly relates to data
transmission at what is referred to as the V-reference point.

A transmission system for transmission of timeslot-oriented data between an exchange termination device and a line termination is normally part of a communications system which has a switching device and subscriber access devices. The subscriber access devices in this case have subscriber interfaces for connection of communications terminals to the communications system. The subscriber access devices are, according to ITU-T Standard G.960, connected via a line termination device and an exchange termination device to the switching device in the communications system. Such a communications system is used to allow narrowband communication connections to be set up and cleared between communications terminals connected to the subscriber access devices, and to allow narrowband communication, for example voice or data communication, between the communications terminals.

In modern communications systems, data transmission between the exchange termination device and the line termination is, in this case, normally carried out on the basis of the IOM-2 (ISDN Oriented Modular Interface) data format, which is formed from a periodic sequence of channel-specific information segments; hereinafter referred to as a time-division multiplex channel. In this case, one time-division multiplex channel is, in each case, generally assigned to each subscriber interface of a subscriber access device.

However, in modern communications technology, there is an increasing requirement for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". As a consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements for data transmission (high speed with a variable transmission bit rate) but also of the requirements for voice data transmission (maintenance of time correlation during data transmission via a communications network) in order to allow the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the Asynchronous Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.

In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching data that are relevant for transport for an ATM cell and has a length of five bytes and a 48-byte long payload.

Data transmission via an ATM-based communications network generally takes place within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM network nodes in the ATM-based communications network, with switching information including a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual path identification is assigned a VPI value. The switching information entered in the connection table in an ATM network node defines how the virtual paths and virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM network node are associated with one another via the signaling; that is, which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) essentially have switching data including a VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node; that is, the switching data arranged therein is recorded and assessed. The ATM cells are then passed on by the ATM network node, on the basis of the switching information stored in the connection table, to an ATM network node output which represents a specific destination.

The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination device and a line termination, in which the data transmission is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of communications terminals are provided by ATM hub units, as they are referred to in the literature, which are connected to the ATM-based communications network. The exchange termination device in the communications system, and the line termination formed by the ATM hub unit in this case, each have an ATM access unit via which, firstly, a connection to the ATM-based communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and the packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is, in this case, carried out on the basis of two different conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance

with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is, in this case, used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System Interconnection). In the second conversion mode, the timeslot-oriented data is packed in bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented communications network, with the timeslot-oriented IOM-2 data format being used for data transmission between the communications devices. In this case, the information segments are transmitted communications network.

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et al.: "Adaptive Digital Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

The present invention is directed toward specifying an alternative method via which bidirectional data transmission can take place between the communications terminals and the exchange.

SUMMARY OF THE INVENTION

In order to allow better understanding of the method of operation of the transmission of timeslot-oriented data between an exchange termination device and a line termination, it appears to be necessary, first of all, to explain the known principles once again, in more detail.

Transmission of timeslot-oriented data between the exchange termination device and the line termination normally takes place on the basis of the IOM-2 data format which is known, for example, from the product document "ICs for Communications - IOM[®]-2 Interface Reference Guide" from Siemens Munich, 3/91, Order No. B115-H6397-X-X-7600, in particular pages 6 to 12.

Figure 1, which shows a schematic illustration of the IOM-2 data format is intended to allow the relationships to be understood more quickly, on the basis of which time-division

multiplex frames IOM-R are transmitted periodically, with a length of 125 μ s. Such a time-division multiplex frame IOM-R is subdivided into time-division multiplex channels or subframes CH0,...,CH7, frequently referred to in the literature just as a "channel". The subframes CH0,...,CH7 are, in turn, each subdivided into two 8-bit long user data channels B1, B2, into an 8-bit long monitor channel M, into a 2-bit long signaling channel DI, into a 4-bit long status channel C/I (Command / Indicate) via two monitor status channels MR, MX, which each have a length of 1 bit. The signaling channel DI, the status channel C/I and the two monitor status channels MR, MX are normally referred to in summarized form in the literature as the control channel D.

User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate of 64 kbps, in each case. Control information associated with the transmission of user data information is transmitted via the signaling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, inter alia, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit) are, in this case, used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus (MR = 1, MX = 0), or is emitted to the IOM-2 bus (MR = 0, MX = 1). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel C/I.

Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network via ATM cells in accordance with the first ATM adaptation layer AAL1 since, irrespective of whether data is or is not actually being transmitted, all the channel information (information for the two user data channels B1, B2, for the monitor channel M and for the control channel D) must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network via ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information items, transmitting up-to-date data. Modules which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

A major advantage of the method according to the present invention is now that the method can be implemented in a simple manner in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T
5 Standard G.960.

A further advantage of the method according to the present invention is that the transmission of the information segments which are intended for transmission of signaling information, this corresponding to the data transmitted using the signaling channel in the IOM-2 data format, and of the information segments which are intended for transmission of
10 user data information, this corresponding to the data transmitted via the user data channels in the IOM-2 data format, in separate data cells allows for user data information to be transmitted via the packet-oriented communications network only in situations in which user data actually need to be transmitted in the information segments intended for this purpose.

One advantage of the refinements of an embodiment of the present invention is, inter alia, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network via ATM cells in accordance with the fifth ATM adaptation layer AAL5, so that no new developments are required.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

20 BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic illustration of the IOM-2 data format.

Figure 2 shows a structogram schematically illustrating the major function of units involved in the method according to the present invention.

Figure 3 shows a structogram schematically illustrating the virtual channels which are
25 set up in accordance with a first transmission mode for data transmission via an ATM-based communications network.

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

30 DETAILED DESCRIPTION OF THE INVENTION

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to

the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-KN. Communications terminals KE1,...,KEN are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN via interfaces derived from this, U_{p0} interfaces. In general, a U_{p0} or S_0 interface includes, firstly, two user data channels which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps and, secondly, a signaling channel which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog communications terminals, for example a facsimile terminal can be connected to the ATM-based communications network ATM-KN via a/b interfaces.

The communications terminals KE1,...,KEN are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 via network terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected, in a corresponding manner to the exchange termination device ET in the exchange PBX, via an access unit AE to the ATM-based communications network ATM-KN.

Data can be transmitted via the ATM-based communications network ATM-KN using two different transmission modes which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN, frequently referred to as a virtual connection VC in the literature, using the first transmission mode. When data is transmitted via the ATM-based communications network ATM-KN using the first transmission mode, the signaling information which is provided by a signaling unit (not illustrated) in the exchange PBX, in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format, is transmitted via the ATM-based communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may, in this case, be a connection

set up at that time for the transmission of signaling information or, alternatively, a permanent connection set up in the ATM-based communications network ATM-KN at an administratively predefined transmission bit rate of, for example, 16 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

5 Signaling information is transmitted via the virtual connection VC-DI via ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H, as it is frequently referred to in the literature, which has a length of 5 bytes and contains switching data relevant for the transport of an ATM cell ATMZ, and a payload field, as it is frequently referred to in the literature, with a length of 48 bytes. The
10 use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation Layer) is, in this case, used for matching the ATM cell format (layer 2 of the OSI reference model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).

15 Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also requires that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based
20 communications network ATM-KN between the exchange PBX and the ATM hub unit ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.

25 The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX (in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format) is transmitted in an analogous manner to the signaling
30 information via the ATM-based communications network ATM-KN using a virtual connection VC-MC which is provided exclusively for this purpose. To assist clarity, the information to be transmitted within the status channel C/I and the monitor status channels MR, MX using the IOM-2 data format is combined, for short, by the designation C in Figure 3. IOM-2 data-format-specific information is likewise transmitted via the virtual connection VC-MC via ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5.

The user data information, in a corresponding manner to that within the user channels B1, B2 in the IOM-2 data format, for data to be transmitted is transmitted via a virtual connection VC-B via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1. In this case, depending on the bandwidth required for the communications terminals KE1,...,KE_n which are connected to an ATM hub unit ATM-HUB, user data information for only one user data channel or for a number of user data channels can, in this case, be transmitted in combined form via the virtual connection VC-B. In this way, transmission bit rates of integer multiples of 64 kbps can be provided via the virtual connection VC-B. By way of example, in Figure 3, user data information for two user data channels B1, B2 is being transmitted via the virtual connection VC-B and a transmission bit rate, resulting from this, of 128 kbps.

The data transmitted within the virtual connections VC-DI, VC-MC, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB as shown in Figure 3. When no data is actually being transmitted, corresponding blank data is inserted in the IOM-2 data stream. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format, and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format, are transmitted jointly via the ATM-based communications network ATM-KN, via ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose. The virtual connection VC-MD can, in this case, once again be a connection which is set up at the time for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH which essentially has a length identification (not illustrated) which defines the number of data bytes transmitted in the respective packet element.

The user data information, in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format, is transmitted in an analogous manner to the first transmission mode via a virtual connection VC-B via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in Figure 4. When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream in a corresponding manner. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information and the user data information via the ATM-based communications network ATM-KN allow for transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN to be taken from the ATM-based communications network ATM-KN only when user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are transmitted via the ATM-based communications network ATM-KN, and the user data information which is actually to be transmitted is then transmitted once this has been done.

Although the present invention has been described with reference to specific embodiments, those with skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

In the present communications system, communications terminals are connected via at least one hub unit and an exchange to a packet-based communications network. A timeslot-oriented data format, which is formed from a periodic sequence of channel-specific

information segments, is provided for data transmission between the exchange and the communications terminals. In this case, information segments which are intended for transmission of signaling information, and information segments which are intended for transmission of user data information are transmitted in separate data packets which are intended for data transmission via the packet-oriented communications network.

On page 14, cancel line 1, and substitute the following left-hand justified heading therefor:

CLAIMS

Please cancel 1-10, without prejudice, and substitute the following claims therefor:

11. A method for data transmission between communications devices via a packet-oriented communications network, a method comprising the steps of:

providing a time-slot oriented data format, formed from a periodic sequence of channel-specific information segments, for data transmission between the communications devices, the data format having information segments for transmitting signaling information, information segments for transmitting user data information, and information segments for transmitting data-format-specific information;

transmitting the information segments intended for transmitting the signaling information in first data packets which are intended for data transmission via the packet-oriented communications network; and

transmitting the information segments intended for transmitting the user data information in second information segments which are intended for transmitting the data-format-specific information, using second data packets which are intended for data transmission via the packet-oriented communications network.

12. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the second information segments and the information segments intended for transmitting the signaling information are transmitted jointly in the first data packets.

13. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 12, the method further comprising the step of:

subdividing the first data packets into at least two packet elements, the second information segments being transmitted in the first packet element, and the information

segments intended for transmitting the signaling information being transmitted in the second packet element.

14. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 13, wherein each of the first and second packet elements have a cell header with a length identification, the length identification defining a number of data items transmitted in the respective packet element.

15. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the timeslot-oriented data format is the standardized IOM-2 data format.

16. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the data transmission via the packet-oriented communications network takes place on the basis of the ATM data format.

17. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 16, wherein the information segments intended for transmitting the signaling information are transmitted via the packet-oriented communications network in data packets designed in accordance with the fifth ATM adaptation layer agreement.

18. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 16, wherein the information segments intended for transmitting the user data information are transmitted via the packet-oriented communications network in data packets designed in accordance with the first ATM adaptation layer agreement.

19. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the information segments intended for transmitting the signaling information are transmitted via an existing tie line in the packet-oriented communications network.

20. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the information segments intended for transmitting the signaling information are transmitted via a packet-oriented communications network using a connection which is set up, specifically for this data transmission, between the communications devices.

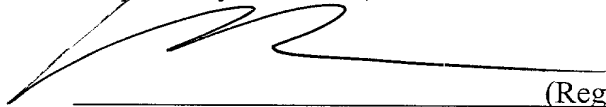
REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "Version With Markings To Show Changes Made".

In addition, the present amendment cancels original claims 1-10 in favor of new claims 11-20. Claims 11-20 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-10 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§103, 102, 103 or 112. Indeed, the cancellation of claims 1-10 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-10.

Early consideration on the merits is respectfully requested.

Respectfully submitted,



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VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

The Specification of the present application, including the Abstract, has been amended as follows:

SPECIFICATION

TITLE OF THE INVENTION

METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED COMMUNICATION NETWORK

BACKGROUND OF THE INVENTION

Description

10 The present invention relates to a method for data transmission between the two
communications devices via a packet-oriented communications network ~~as claimed in the~~
~~precharacterizing clause of patent claim 1.~~ In particular, the present invention relates to a
transmission system for transmission of timeslot-oriented data between an exchange
termination device-, frequently referred to as an exchange termination ET ~~in the literature-~~,
15 and a line termination LT, ~~as it is frequently referred to in the literature.~~ According to the
terminology of ITU-T Standard G.960 (3/93), "access digital section for ISDN basic rate
access" (International Telecommunication Union), in particular pages 2 and 3, the present
invention accordingly relates to data transmission at what is referred to as the V-reference
point.

20 A transmission system for transmission of timeslot-oriented data between an
exchange termination device and a line termination is normally part of a communications
system which has a switching device and subscriber access devices. The subscriber access
devices in this case have subscriber interfaces for connection of communications terminals to
the communications system. The subscriber access devices are, according to ITU-T Standard
25 G.960, connected via a line termination device and an exchange termination device to the
switching device in the communications system. Such a communications system is used to
allow narrowband communication connections to be set up and cleared between
communications terminals connected to the subscriber access devices, and to allow
narrowband communication-, for example voice or data communication-, between the
30 communications terminals.

In modern communications systems, data transmission between the exchange
termination device and the line termination is, in this case, normally carried out on the basis
of the IOM-2 (ISDN Oriented Modular Interface) data format, which is formed from a
periodic sequence of channel-specific information segments-; hereinafter referred to as a

time-division multiplex channel ~~from now on~~. In this case, one time-division multiplex channel is, in each case, generally assigned to each subscriber interface of a subscriber access device.

However, in modern communications technology, there is an increasing requirement for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". ~~In~~ As a consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements for data transmission (high speed with a variable transmission bit rate) but also of the requirements for voice data transmission (maintenance of time correlation during data transmission via a communications network), in order ~~in this way~~ to allow the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the Asynchronous Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.

In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching data that are relevant for transport for an ATM cell and has a length of five bytes and a 48-byte long payload.

Data transmission via an ATM-based communications network generally takes place within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM network nodes in the ATM-based communications network, with switching information ~~comprising~~ including a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual path identification is assigned a VPI value. The switching information entered in the connection table in an ATM network node defines how the virtual paths and virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM network node are associated with one another ~~by means of~~ via the signaling; that is ~~to say~~, which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) essentially have

switching data comprising including a VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node; that is to say, the switching data arranged therein is recorded and assessed. The ATM cells are then passed on by the ATM network node, on the basis of the switching information stored in the connection table, to an ATM network node output, which represents a specific destination.

The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination device and a line termination, in which the data transmission is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of communications terminals are provided by ATM hub units, as they are referred to in the literature, which are connected to the ATM-based communications network. The exchange termination device in the communications system, and the line termination formed by the ATM hub unit in this case, each have an ATM access unit via which, firstly, a connection to the ATM-based communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and the packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is, in this case, carried out on the basis of two different conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is, in this case, used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System Interconnection). In the second conversion mode, the timeslot-oriented data is packed in bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented communications network, with the timeslot-oriented IOM-2 data format being used for data transmission between the communications devices. In this case, the information segments are transmitted communications network.

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et al.: "Adaptive Digital

Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

The present invention is ~~based on the object of~~ directed toward specifying an alternative method, ~~using~~ via which bidirectional data transmission can take place between the communications terminals and the exchange.

~~Based on the features of the precharacterizing clause of patent claim 1, the object is achieved by the characterizing features of this claim.~~

SUMMARY OF THE INVENTION

In order to allow better understanding of the method of operation of the transmission of timeslot-oriented data between an exchange termination device and a line termination, it appears to be necessary, first of all, to explain the known principles once again, in more detail.

Transmission of timeslot-oriented data between the exchange termination device and the line termination normally takes place on the basis of the IOM-2 data format which is known, for example, from the product document "ICs for Communications - IOM[®]-2 Interface Reference Guide" from Siemens Munich, 3/91, Order No. B115-H6397-X-X-7600, in particular pages 6 to 12.

Figure 1, which shows a schematic illustration of the IOM-2 data format is intended to allow the relationships to be understood more quickly, on the basis of which time-division multiplex frames IOM-R are transmitted periodically, with a length of 125 μ s. Such a time-division multiplex frame IOM-R is subdivided into time-division multiplex channels or subframes CH0,...,CH7—also, frequently referred to in the literature just as a "channel". The subframes CH0,...,CH7 are, in turn, each subdivided into two 8-bit long user data channels B1, B2, into an 8-bit long monitor channel M, into a 2-bit long signaling channel DI, into a 4-bit long status channel C/I (Command / Indicate) ~~by means of~~ via two monitor status channels MR, MX, which each have a length of 1 bit. The signaling channel DI, the status channel C/I and the two monitor status channels MR, MX are normally referred to in summarized form in the literature as the control channel D.

User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate of 64 kbps, in each case.

Control information associated with the transmission of user data information is transmitted via the signaling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, inter alia, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit) are, in this case, used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus (MR = 1, MX = 0), or is emitted to the IOM-2 bus (MR = 0, MX = 1). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel C/I.

Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network ~~by means of~~ via ATM cells in accordance with the first ATM adaptation layer AAL1, since, irrespective of whether data is or is not actually being transmitted, all the channel information (information for the two user data channels B1, B2, for the monitor channel M and for the control channel D-) must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network ~~by means of~~ via ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information items, transmitting up-to-date data. Modules which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

A major advantage of the method according to the present invention is now that the method can be implemented in a simple manner in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T Standard G.960.

A further advantage of the method according to the present invention is that the transmission of the information segments which are intended for transmission of signaling information-, this ~~corresponds~~ corresponding to the data transmitted using the signaling channel in the IOM-2 data format-, and of the information segments which are intended for transmission of user data information-, this ~~corresponds~~ corresponding to the data transmitted via the user data channels in the IOM-2 data format-, in separate data cells ~~means that~~ allows for user data information is to be transmitted via the packet-oriented communications

network only in situations in which user data actually need to be transmitted in the information segments intended for this purpose.

~~Advantageous developments of the invention are specified in the dependent claims.~~

One advantage of the refinements of an embodiment of the present invention defined
5 ~~in the dependent claims~~ is, inter alia, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network ~~by means of~~
via ATM cells in accordance with the fifth ATM adaptation layer AAL5, so that no new developments are required.

Additional features and advantages of the present invention are described in, and will
10 be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic illustration of the IOM-2 data format. ~~An exemplary embodiment of the invention will be explained in more detail in the following text with reference to the drawing, in which:~~

Figure 2 shows a structogram schematically illustrating the major function of units involved in the method according to the present invention.

Figure 3 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a first transmission mode for data transmission via an ATM-based communications network.

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

DETAILED DESCRIPTION OF THE INVENTION

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch
25 Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-
30 KN. Communications terminals KE1,...,KE_n are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN ~~by means of~~ via interfaces derived from this, U_{p0}

interfaces. In general, a U_{p0} or S_0 interface comprises includes, firstly, two user data channels, which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps; and, secondly, a signaling channel, which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog communications terminals, for example a facsimile terminal, can be connected to the ATM-based communications network ATM-KN via a/b interfaces.

The communications terminals KE_1, \dots, KE_n are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 ~~by means of~~ via network terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected, in a corresponding manner to the exchange termination device ET in the exchange PBX, via an access unit AE to the ATM-based communications network ATM-KN.

Data can be transmitted via the ATM-based communications network ATM-KN using two different transmission modes, which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN, frequently referred to as a virtual connection VC in the literature, using the first transmission mode. When data is transmitted via the ATM-based communications network ATM-KN using the first transmission mode, the signaling information which is provided by a signaling unit (not illustrated) in the exchange PBX, in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format, is transmitted via the ATM-based communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may, in this case, be a connection set up at that time for the transmission of signaling information or, alternatively, a permanent connection set up in the ATM-based communications network ATM-KN at an administratively predefined

transmission bit rate of, for example, 16 kbps, between the exchange PBX and the ATM hub unit ATM-HUB.

Signaling information is transmitted via the virtual connection VC-DI ~~by means of~~ via ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H-, as it is frequently referred to in the literature-, which has a length of 5 bytes and contains switching data relevant for the transport of an ATM cell ATMZ, and a payload field-, as it is frequently referred to in the literature-, with a length of 48 bytes. The use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation Layer) is, in this case, used for matching the ATM cell format (layer 2 of the OSI reference model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).

Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also ~~means~~ requires that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based communications network ATM-KN, between the exchange PBX and the ATM hub unit ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.

The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX -(in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels

MR, MX in the IOM-2 data format-) is transmitted in an analogous manner to the signaling information via the ATM-based communications network ATM-KN using a virtual connection VC-MC which is provided exclusively for this purpose. To assist clarity, the information to be transmitted within the status channel C/I and the monitor status channels MR, MX using the IOM-2 data format is combined, for short, by the designation C in ~~the figure~~ Figure 3. IOM-2 data-format-specific information is likewise transmitted via the virtual connection VC-MC ~~by means of~~ via ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5.

The user data information-, in a corresponding manner to that within the user channels B1, B2 in the IOM-2 data format-, for data to be transmitted is transmitted via a virtual connection VC-B ~~by means of~~ via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1. In this case, depending on the bandwidth required for the

communications terminals KE1,...,KE_n which are connected to an ATM hub unit ATM-HUB, user data information for only one user data channel or for a number of user data channels can, in this case, be transmitted in combined form via the virtual connection VC-B. In this way, transmission bit rates of integer multiples of 64 kbps can be provided via the virtual connection VC-B. By way of example, in the figure Figure 3, user data information for two user data channels B1, B2 is being transmitted via the virtual connection VC-B and a transmission bit rate, resulting from this, of 128 kbps.

The data transmitted within the virtual connections VC-DI, VC-MC, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB as shown in the figure Figure 3. When no data is actually being transmitted, corresponding blank data is inserted in the IOM-2 data stream. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format, and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format, are transmitted jointly via the ATM-based communications network ATM-KN, by means of via ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose. The virtual connection VC-MD can, in this case, once again be a connection which is set up at the time for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH, which essentially has a length

identification (not illustrated) which defines the number of data bytes transmitted in the respective packet element.

The user data information, in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format, is transmitted in an analogous manner to the first transmission mode via a virtual connection VC-B by means of
5 via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in the figure Figure 4. When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream
10 in a corresponding manner. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information and the user data information via the ATM-based communications network ATM-KN mean that allow for transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN are to be taken from the ATM-based communications network ATM-KN only when user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are transmitted via the ATM-based communications network ATM-KN,
15 and the user data information which is actually to be transmitted is then transmitted once this has been done.

~~Additional features and advantages of~~ Although the present invention has been described with reference to specific embodiments, those with skill in the art will recognize
25 that changes may be made thereto are described in, and will be apparent from, the following Detailed Description of the Invention and the figures.

~~It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the present invention and without diminishing its intended advantages. It is therefore intended that such changes and modifications be covered by the appended claims.~~ invention as set forth in the hereafter appended claims.
30

Abstract

Method for data transmission via a packet-oriented communications network

ABSTRACT OF THE DISCLOSURE

In the present communications system, communications terminals (~~KE1,...,KEN~~) are
5 connected via at least one hub unit (~~ATM-HUB~~) and an exchange (~~PBX~~) to a packet-based
communications network(~~ATM-KN~~). A timeslot-oriented data format(~~IOM-2~~), which is
formed from a periodic sequence of channel-specific information segments(~~B1, B2, M, DI,~~
~~C~~), is provided for data transmission between the exchange (~~PBX~~) and the communications
terminals(~~KE1,...,KEN~~). In this case, information segments (~~DI~~) which are intended for
10 transmission of signaling information, and information segments (~~B1, B2, M, C~~) which are
intended for transmission of user data information are transmitted in separate data packets
(~~ATMZ~~), which are intended for data transmission via the packet-oriented communications
network(~~ATM-KN~~).

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OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

SUBMISSION OF DRAWINGS

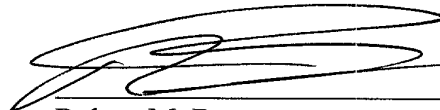
APPLICANTS: Werner Stockl et al. DOCKET NO.: 112740-262
SERIAL NO: GROUP ART UNIT:
FILED: EXAMINER:
INTERNATIONAL APPLICATION NO. PCT/DE00/00761
INTERNATIONAL FILING DATE: 10 March 2000
INVENTION: METHOD FOR DATA TRANSMISSION VIA A PACKET-
ORIENTED COMMUNICATION NETWORK

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Applicant herewith submits four sheets (Figs. 1-4) of drawings for the above-
referenced PCT application.

Respectfully submitted,



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GR 99 P 1405

Description

Method for data transmission via a packet-oriented communications network

5

The invention relates to a method for data transmission between the two communications devices via a packet-oriented communications network as claimed in the precharacterizing clause of patent claim 1. In particular, the invention relates to a transmission system for transmission of timeslot-oriented data between an exchange termination device - frequently referred to as an exchange termination ET in the literature - and a line termination LT, as it is frequently referred to in the literature. According to the terminology of ITU-T Standard G.960 (3/93), "access digital section for ISDN basic rate access" (International Telecommunication Union), in particular pages 2 and 3, the invention accordingly relates to data transmission at what is referred to as the V-reference point.

A transmission system for transmission of timeslot-oriented data between an exchange termination device and a line termination is normally part of a communications system which has a switching device and subscriber access devices. The subscriber access devices in this case have subscriber interfaces for connection of communications terminals to the communications system. The subscriber access devices are, according to ITU-T Standard G.960, connected via a line termination device and an exchange termination device to the switching device in the communications system. Such a communications system is used to allow narrowband communication connections to be set up and cleared between communications terminals connected to the subscriber access devices, and to allow narrowband

In modern communications systems, data transmission between the exchange termination device and the line termination is in this case normally carried out on the basis of the IOM-2 (ISDN Oriented Modular Interface) data format, which is formed from a periodic sequence of channel-specific information segments - referred to as a time-division multiplex channel from now on. In this case, one time-division multiplex channel is in each case generally assigned to each subscriber interface of a subscriber access device.

However, in modern communications technology, there is an increasing requirement for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". In consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements for data transmission (high speed with a variable transmission bit rate) but also of the requirements for voice data transmission (maintenance of time correlation during data transmission via a communications network), in order in this way to allow the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the Asynchronous Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.

In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching data

[illegible]

48-byte long payload.

Data transmission via an ATM-based communications network generally takes place within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM network nodes in the ATM-based communications network, with switching information comprising a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual path identification is assigned a VPI value. The switching information entered in the connection table in an ATM network node defines how the virtual paths and virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM network node are associated with one another by means of the signaling, that is to say which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) essentially have switching data comprising a VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node, that is to say the switching data arranged therein is recorded and assessed. The ATM cells are then passed on by the ATM network node, on the basis of the switching information stored in the connection table, to an ATM network node output, which represents a specific destination.

The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination

Parameter	Unit	Value	Standard Error	t-Statistic	p-Value
Intercept		1.0000	0.0000	1.0000	0.0000
Age	Years	0.0000	0.0000	0.0000	0.0000
Gender		0.0000	0.0000	0.0000	0.0000
Marital Status		0.0000	0.0000	0.0000	0.0000
Education	Years	0.0000	0.0000	0.0000	0.0000
Income	\$/Year	0.0000	0.0000	0.0000	0.0000
Health		0.0000	0.0000	0.0000	0.0000
Smoking		0.0000	0.0000	0.0000	0.0000
Alcohol		0.0000	0.0000	0.0000	0.0000
Exercise		0.0000	0.0000	0.0000	0.0000
Stress		0.0000	0.0000	0.0000	0.0000
Depression		0.0000	0.0000	0.0000	0.0000
Loneliness		0.0000	0.0000	0.0000	0.0000
Life Satisfaction		0.0000	0.0000	0.0000	0.0000
Resilience		0.0000	0.0000	0.0000	0.0000
Optimism		0.0000	0.0000	0.0000	0.0000
Gratitude		0.0000	0.0000	0.0000	0.0000
Forgiveness		0.0000	0.0000	0.0000	0.0000
Compassion		0.0000	0.0000	0.0000	0.0000
Kindness		0.0000	0.0000	0.0000	0.0000
Generosity		0.0000	0.0000	0.0000	0.0000
Humility		0.0000	0.0000	0.0000	0.0000
Patience		0.0000	0.0000	0.0000	0.0000
Self-Control		0.0000	0.0000	0.0000	0.0000
Emotional Stability		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000	0.0000	0.0000	0.0000
Extraversion		0.0000	0.0000	0.0000	0.0000
Conscientiousness		0.0000	0.0000	0.0000	0.0000
Openness		0.0000	0.0000	0.0000	0.0000
Agreeableness		0.0000	0.0000	0.0000	0.0000
Neuroticism		0.0000			

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is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of communications terminals are provided by ATM hub units, as they are referred to in the literature, which are
5 connected to the ATM-based communications network. The exchange termination device in the communications system, and the line termination formed by the ATM hub unit in this case each have an ATM access unit via which, firstly, a connection to the ATM-based
10 communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and the
15 packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is in this case carried out on the basis of
20 two different conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is
25 in this case used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System Interconnection). In the second conversion mode, the timeslot-oriented data is
30 packed in bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification
35 DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented communications network, with the timeslot-oriented IOM-2 data format being used for data

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transmission between the communications devices. In this case, the information segments are transmitted jointly in one ATM cell via the packet-oriented communications network.

5

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et. al.: "Adaptive Digital Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

The present invention is based on the object of specifying an alternative method, using which bidirectional data transmission can take place between the communications terminals and the exchange.

User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate

of 64 kbps, in each case. Control information associated with the transmission of user data information is transmitted via the signaling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, inter alia, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit) are in this case used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus (MR = 1, MX = 0), or is emitted to the IOM-2 bus (MR = 0, MX = 1). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel C/I.

Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network by means of ATM cells in accordance with the first ATM adaptation layer AAL1, since, irrespective of whether data is or is not actually being transmitted, all the channel information - information for the two user data channels B1, B2, for the monitor channel M and for the control channel D - must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network by means of ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information items, transmitting up-to-date data. Modules which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

A major advantage of the method according to the invention is now that the method can be implemented in a simple manner

[illegible]

in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T
5 Standard G.960.

A further advantage of the method according to the invention is that the transmission of the information segments which are intended for transmission of
10 signaling information - this corresponds to the data transmitted using the signaling channel in the IOM-2 data format - and of the information segments which are intended for transmission of user data information -
15 this corresponds to the data transmitted via the user data channels in the IOM-2 data format - in separate data cells means that user data information is transmitted via the packet-oriented communications network only in situations in which user data actually
20 need to be transmitted in the information segments intended for this purpose.

Advantageous developments of the invention are specified in the dependent claims.

25 One advantage of the refinements of the invention defined in the dependent claims is, inter alia, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network by means of ATM cells in accordance with the
30 fifth ATM adaptation layer AAL5, so that no new developments are required.

An exemplary embodiment of the invention will be explained in more detail in the following text with
35 reference to the drawing, in which:

Figure 2 shows a structogram schematically illustrating the major function of units

involved in the method according to the invention;

[illegible]

Figure 3 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a first transmission mode for data transmission via an ATM-based communications network;

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-KN. Communications terminals KE1,...,KE_n are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN by means of interfaces derived from this, U_{p0} interfaces. In general, a U_{p0} or S_0 interface comprises firstly two user data channels, which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps, and secondly a signaling channel, which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog communications terminals - for example a facsimile terminal - can be

connected to the ATM-based communications network ATM-KN via a/b interfaces.

The communications terminals KE1,...,KE_n are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 by means of network terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected - in a corresponding manner to the exchange termination device ET in the exchange PBX - via an access unit AE to the ATM-based communications network ATM-KN.

Data can be transmitted via the ATM-based communications network ATM-KN using two different transmission modes, which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN - frequently referred to as a virtual connection VC in the literature - using the first transmission mode. When data is transmitted via the ATM-based communications network ATM-KN using the first transmission mode, the signaling information which is provided by a signaling unit (not illustrated) in the exchange PBX - in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format - is transmitted via the ATM-based communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may in this case be a connection set up at that time for the transmission of

signaling information or, alternatively, a permanent connection set up in the ATM-based communications network ATM-KN at an administratively predefined

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transmission bit rate of, for example, 16 kbps, between the exchange PBX and the ATM hub unit ATM-HUB.

5 Signaling information is transmitted via the virtual connection VC-DI by means of ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H - as it is frequently referred to in the literature - which has a length of 5 bytes and contains switching data relevant
10 for the transport of an ATM cell ATMZ, and a payload field - as it is frequently referred to in the literature - with a length of 48 bytes. The use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information
15 allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation Layer) is in this case used for matching the ATM cell format (layer
20 2 of the OSI reference model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).

25 Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also means that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based communications network ATM-KN, between the exchange PBX and the ATM hub unit
30 ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.

35 The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX - in a corresponding manner to the data to

be transmitted within the monitor channel M, the status channel C/I and the monitor status channels

Case	Age	Sex	Site	Pathologic	Survival
1	65	M	Rectum	Adenocarcinoma	10 years
2	72	F	Rectum	Adenocarcinoma	12 years
3	68	M	Rectum	Adenocarcinoma	11 years
4	70	F	Rectum	Adenocarcinoma	13 years
5	66	M	Rectum	Adenocarcinoma	14 years
6	71	F	Rectum	Adenocarcinoma	15 years
7	69	M	Rectum	Adenocarcinoma	16 years
8	73	F	Rectum	Adenocarcinoma	17 years
9	67	M	Rectum	Adenocarcinoma	18 years
10	74	F	Rectum	Adenocarcinoma	19 years
11	64	M	Rectum	Adenocarcinoma	20 years
12	75	F	Rectum	Adenocarcinoma	21 years
13	63	M	Rectum	Adenocarcinoma	22 years
14	76	F	Rectum	Adenocarcinoma	23 years
15	62	M	Rectum	Adenocarcinoma	24 years
16	77	F	Rectum	Adenocarcinoma	25 years
17	61	M	Rectum	Adenocarcinoma	26 years
18	78	F	Rectum	Adenocarcinoma	27 years
19	60	M	Rectum	Adenocarcinoma	28 years
20	79	F	Rectum	Adenocarcinoma	29 years
21	59	M	Rectum	Adenocarcinoma	30 years
22	80	F	Rectum	Adenocarcinoma	31 years
23	58	M	Rectum	Adenocarcinoma	32 years
24	81	F	Rectum	Adenocarcinoma	33 years
25	57	M	Rectum	Adenocarcinoma	34 years
26	82	F	Rectum	Adenocarcinoma	35 years
27	56	M	Rectum	Adenocarcinoma	36 years
28	83	F	Rectum	Adenocarcinoma	37 years
29	55	M	Rectum	Adenocarcinoma	38 years
30	84	F	Rectum	Adenocarcinoma	39 years
31	54	M	Rectum	Adenocarcinoma	40 years
32	85	F	Rectum	Adenocarcinoma	41 years
33	53	M	Rectum	Adenocarcinoma	42 years
34	86	F	Rectum	Adenocarcinoma	43 years
35	52	M	Rectum	Adenocarcinoma	44 years
36	87	F	Rectum	Adenocarcinoma	45 years
37	51	M	Rectum	Adenocarcinoma	46 years
38	88	F	Rectum	Adenocarcinoma	47 years
39	50	M	Rectum	Adenocarcinoma	48 years
40	89	F	Rectum	Adenocarcinoma	49 years
41	49	M	Rectum	Adenocarcinoma	50 years
42	90	F	Rectum	Adenocarcinoma	51 years
43	48	M	Rectum	Adenocarcinoma	52 years
44	91	F	Rectum	Adenocarcinoma	53 years
45	47	M	Rectum	Adenocarcinoma	54 years
46	92	F	Rectum	Adenocarcinoma	55 years
47	46	M	Rectum	Adenocarcinoma	56 years
48	93	F	Rectum	Adenocarcinoma	57 years
49	45	M	Rectum	Adenocarcinoma	58 years
50	94	F	Rectum	Adenocarcinoma	59 years
51	44	M	Rectum	Adenocarcinoma	60 years
52	95	F	Rectum	Adenocarcinoma	61 years
53	43	M	Rectum	Adenocarcinoma	62 years
54	96	F	Rectum	Adenocarcinoma	63 years
55	42	M	Rectum	Adenocarcinoma	64 years
56	97	F	Rectum	Adenocarcinoma	65 years
57	41	M	Rectum	Adenocarcinoma	66 years
58	98	F	Rectum	Adenocarcinoma	67 years
59	40	M	Rectum	Adenocarcinoma	68 years
60	99	F	Rectum	Adenocarcinoma	69 years
61	39	M	Rectum	Adenocarcinoma	70 years
62	100	F	Rectum	Adenocarcinoma	71 years
63	38	M	Rectum	Adenocarcinoma	72 years
64	101	F	Rectum	Adenocarcinoma	73 years
65	37	M	Rectum	Adenocarcinoma	74 years
66	102	F	Rectum	Adenocarcinoma	75 years
67	36	M	Rectum	Adenocarcinoma	76 years
68	103	F	Rectum	Adenocarcinoma	77 years
69	35	M	Rectum	Adenocarcinoma	78 years
70	104	F	Rectum		

MR, MX in the IOM-2 data format - is transmitted in an analogous manner to the signaling information via the ATM-based communications network ATM-KN using a virtual connection VC-MC which is provided exclusively for this purpose. To assist clarity, the information to be transmitted within the status channel C/I and the monitor status channels MR, MX using the IOM-2 data format is combined, for short, by the designation C in the figure. IOM-2 data-format-specific information is likewise transmitted via the virtual connection VC-MC by means of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5.

The user data information - in a corresponding manner to that within the user channels B1, B2 in the IOM-2 data format - for data to be transmitted is transmitted via a virtual connection VC-B by means of ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1. In this case, depending on the bandwidth required for the communications terminals KE1,...,KEN which are connected to an ATM hub unit ATM-HUB, user data information for only one user data channel or for a number of user data channels can in this case be transmitted in combined form via the virtual connection VC-B. In this way, transmission bit rates of integer multiples of 64 kbps can be provided via the virtual connection VC-B. By way of example, in the figure, user data information for two user data channels B1, B2 is being transmitted via the virtual connection VC-B and a transmission bit rate, resulting from this, of 128 kbps.

The data transmitted within the virtual connections VC-DI, VC-MC, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB as shown in the figure. When no data is actually being transmitted, corresponding blank data is inserted in the IOM-2 data stream. Data originating from the ATM hub unit ATM-HUB

is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX - in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format - and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX - in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format - are transmitted jointly via the ATM-based communications network ATM-KN, by means of ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose. The virtual connection VC-MD can in this case once again be a connection which is set up at the time for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH, which essentially has a length identification (not illustrated) which defines

the number of data bytes transmitted in the respective packet element.

The user data information - in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format - is transmitted in an analogous manner to the first transmission mode via a virtual connection VC-B by means of ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in the figure. When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream in a corresponding manner. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information and the user data information via the ATM-based communications network ATM-KN mean that transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN are taken from the ATM-based communications network ATM-KN only when user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are transmitted via the ATM-based communications network ATM-KN, and the user data information which is actually to be transmitted is then transmitted once this has been done.

Patent Claims

1. A method for data transmission between communications devices via a packet-oriented communications network (ATM-KN),
5 with a timeslot oriented data format (IOM-2), which is formed from a periodic sequence of channel-specific information segments (B1, B2, M, DI, C) being provided for data transmission
10 between the communications devices, and with the data format (IOM-2) having information segments (DI) for transmission of signaling information, information segments (B1, B2) for transmission of user data information, and information segments
15 (M, C) for transmission of data-format-specific information, characterized
in that the information segments (DI) intended for transmission of the signaling information are
20 transmitted in first data packets (ATMZ) which are intended for data transmission via the packet-oriented communications network (ATM-KN), and the information segments (B1, B2) which are intended for transmission of user data information are
25 transmitted in second information segments (M, C), which are intended for transmission of data-format-specific information, using third data packets (ATMZ), which are intended for data transmission via the packet-oriented
30 communications network (ATM-KN).
2. The method as claimed in claim 1, characterized
in that the information segments (M, C) which are
35 intended for transmission of data-format-specific information, and the data segments (DI) which are intended for transmission of signaling

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

[illegible]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

[illegible]

3. The method as claimed in claim 2,
characterized
in that the first data packets (ATMZ) are
subdivided into at least two packet elements (TP1,
5 TP2), with the information segments (M, C) which
are intended for transmission of data-format-
specific information being transmitted in a first
packet element (TP1), and the information segments
(DI) which are intended for transmission of
10 signaling information being transmitted in a
second packet element (TP2).
4. The method as claimed in claim 3,
characterized
15 in that the packet elements (TP1, TP2) each have a
cell header (SH) with a length identification,
with the length identification defining the number
of data items transmitted in a respective packet
element (TP1, TP2).
- 20 5. The method as claimed in one of the preceding
claims,
characterized
in that the timeslot-oriented data format (IOM-2)
25 is the standardized IOM-2 data format.
6. The method as claimed in one of the preceding
claims,
characterized
30 in that data transmission via the packet-oriented
communications network (ATM-KN) takes place on the
basis of the ATM data format (Asynchronous
Transfer Mode).
- 35 7. The method as claimed in claim 6,
characterized
in that the information segments (DI) which are
intended for transmission of signaling

information are transmitted via the packet-oriented communications network (ATM-KN) in data packets (ATMZ) which are designed in accordance with an agreement which is known as the fifth ATM
5 adaptation layer (AAL5).

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8. The method as claimed in claim 6 or 7,
characterized
in that the information segments (B1, B2) which
are intended for transmission of use of data
information are transmitted via the packet-
oriented communications network (ATM-KN) in data
packets (ATMZ) which are designed in accordance
with an agreement which is known as the first ATM
adaptation layer AAL1.
9. The method as claimed in one of the preceding
claims,
characterized
in that the information segments (DI) which are
intended for transmission of signaling information
are transmitted via an existing tieline in the
packet-oriented communications network (ATM-KN).
10. The method as claimed in one of claims 1 to 8,
characterized
in that the information segments (DI) which are
intended for transmission of signaling information
are transmitted via a packet-oriented
communications network (ATM-KN) using a connection
which is set up, specifically for this data
transmission, between the communications devices.

Abstract

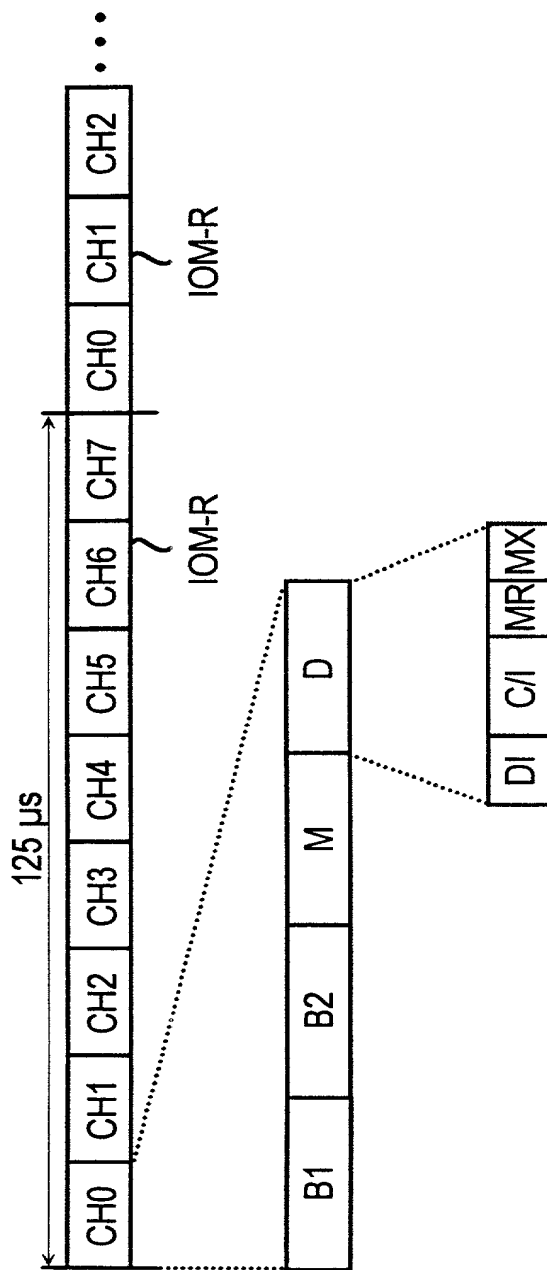
Method for data transmission via a packet-oriented communications network

5

In the present communications system, communications terminals (KE1,...,KEN) are connected via at least one hub unit (ATM-HUB) and an exchange (PBX) to a packet-based communications network (ATM-KN). A timeslot-oriented data format (IOM-2), which is formed from a periodic sequence of channel-specific information segments (B1, B2, M, DI, C), is provided for data transmission between the exchange (PBX) and the communications terminals (KE1,...,KEN). In this case, information segments (DI) which are intended for transmission of signaling information, and information segments (B1, B2, M, C) which are intended for transmission of user data information are transmitted in separate data packets (ATMZ), which are intended for data transmission via the packet-oriented communications network (ATM-KN).

Figure 2

Fig 1



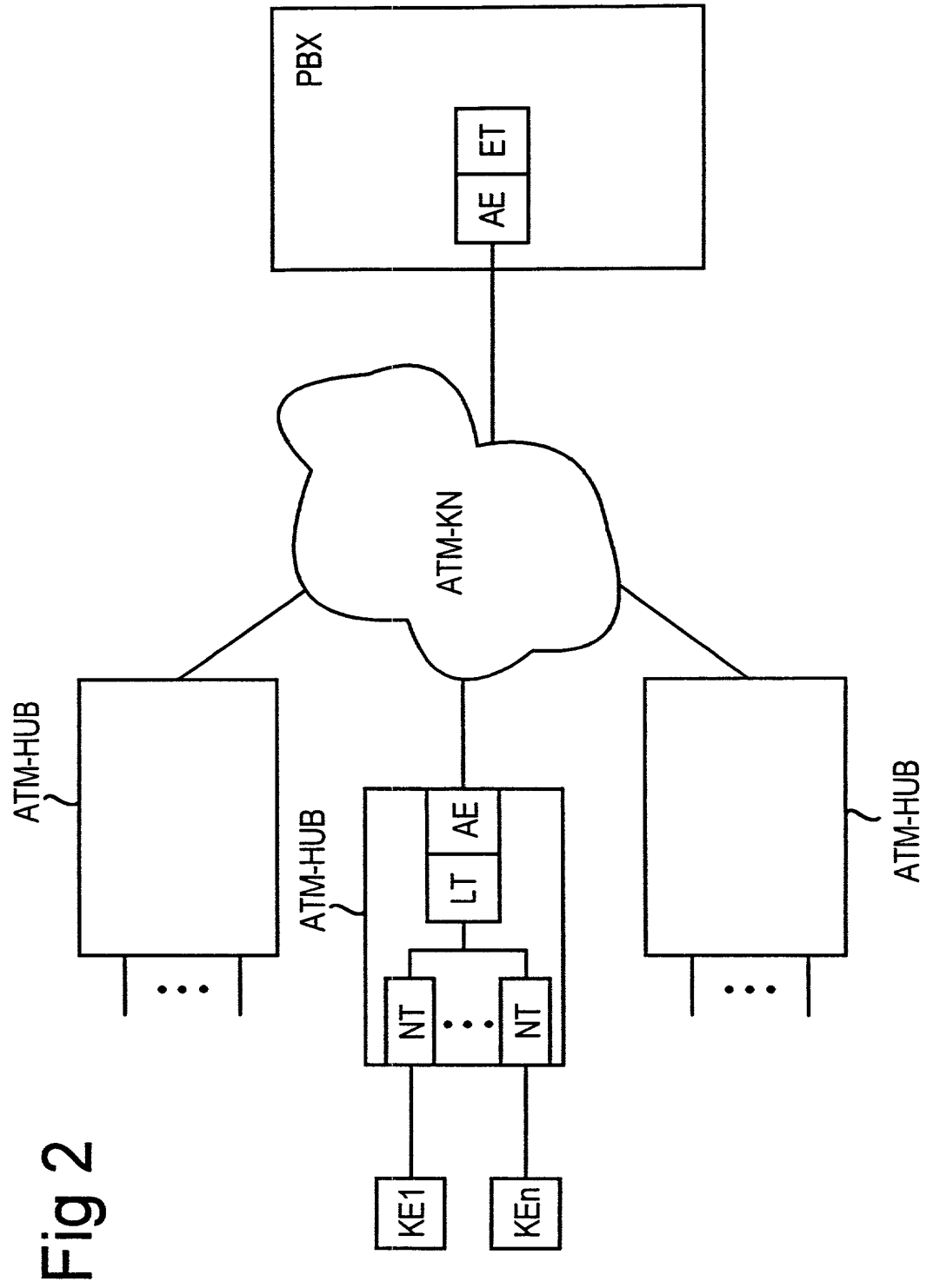


Fig 2

Fig 3

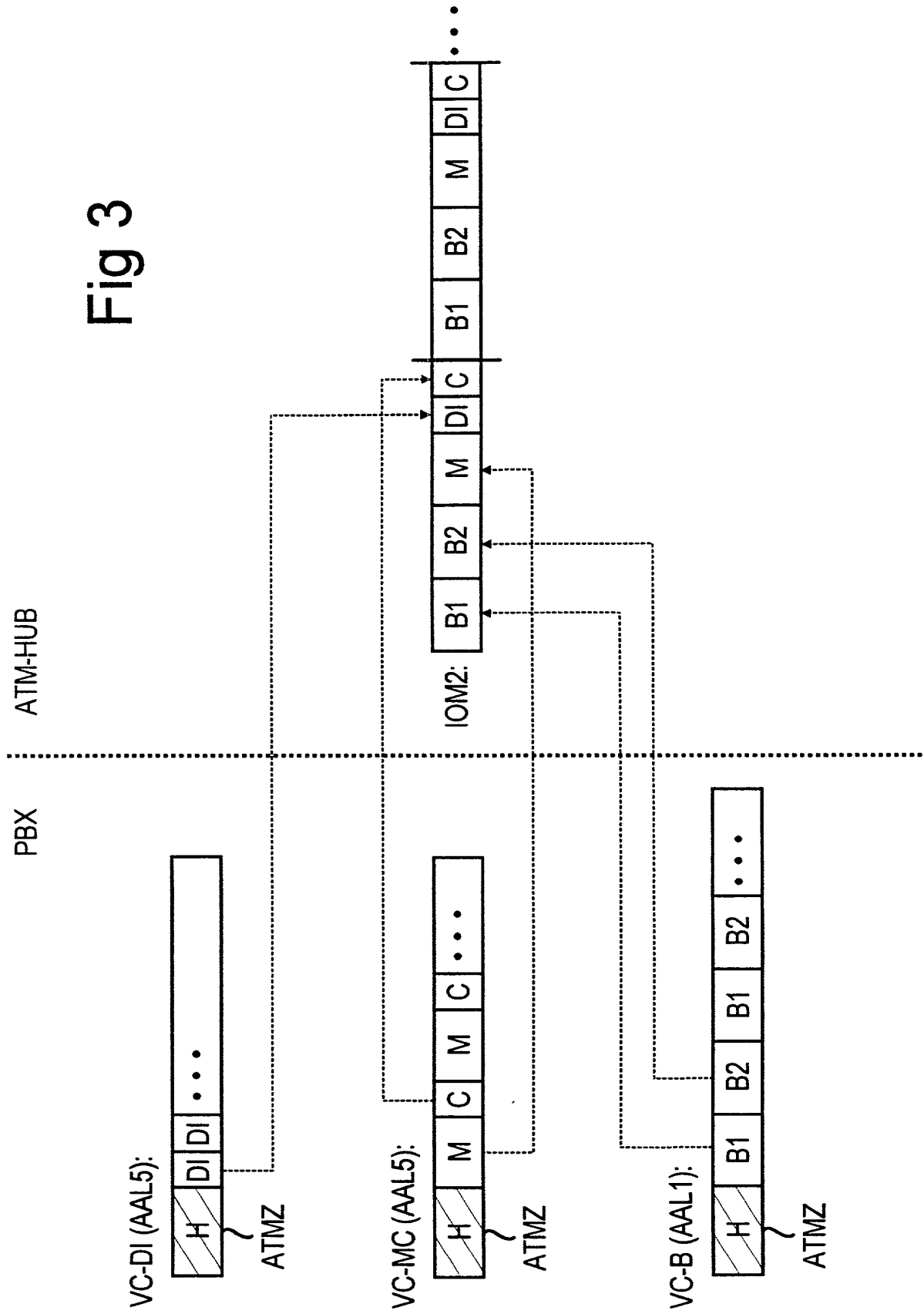
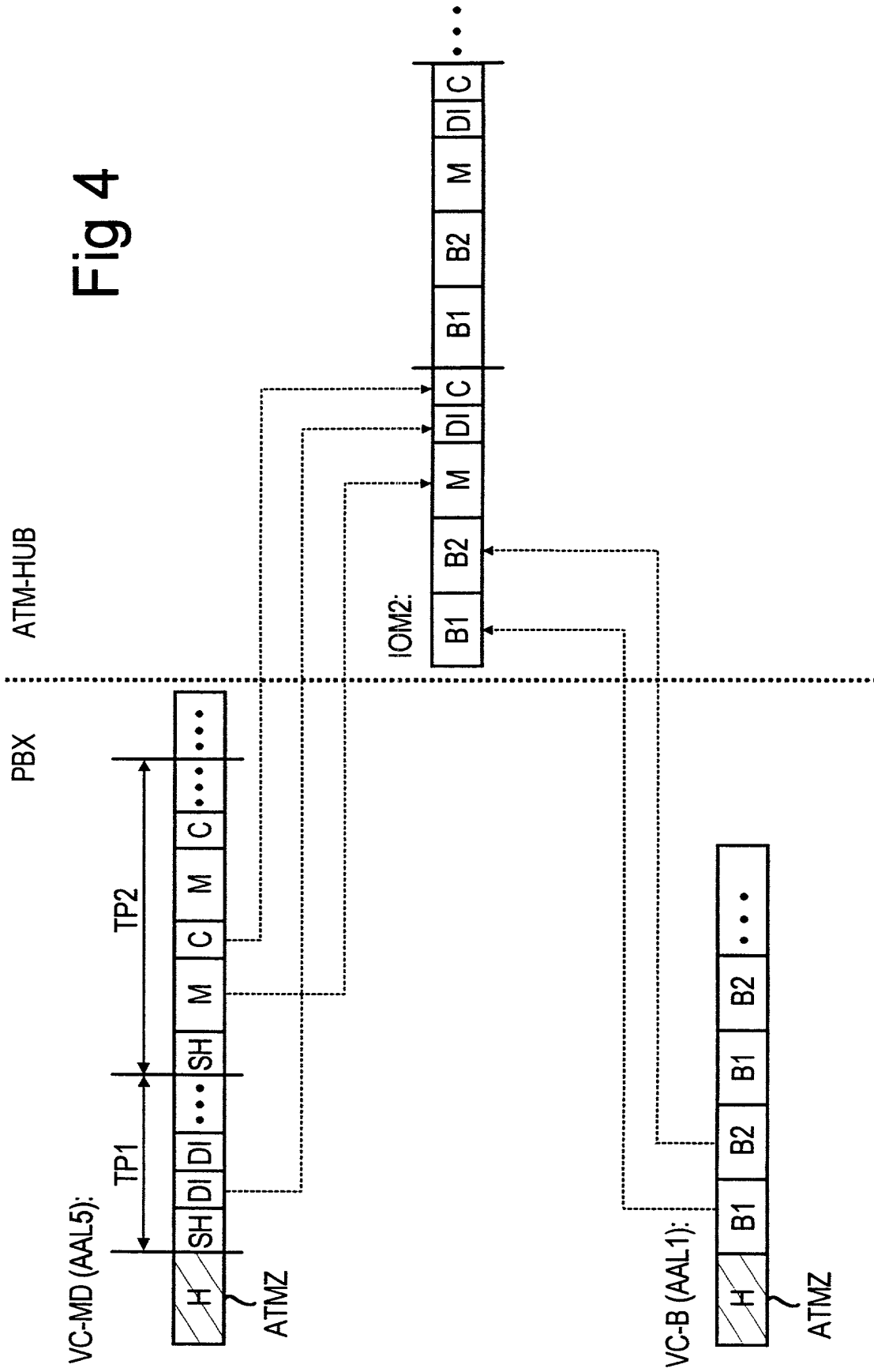


Fig 4



Declaration and Power of Attorney For Patent Application

Erklärung Für Patentanmeldungen Mit Vollmacht

German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren zur Datenermittlung über
ein paket-orientiertes
Kommunikationsnetz

Method of transmitting data via a packet-
oriented communications network

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)

(check one)

☐ hier beigefügt ist.

☐ is attached hereto.

☒ am 10.03.2000 als

☒ was filed on 10.03.2000 as

PCT internationale Anmeldung

PCT international application

PCT Anmeldungsnummer PCT/DE00/00761

PCT Application No. PCT/DE00/00761

eingereicht wurde und am

and was amended on

abgeändert wurde (falls tatsächlich abgeändert).

(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign applications
Priorität beansprucht

Priority Claimed

19910888.9

DE

11.03.1999

☒

☐

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

Yes
Ja

No
Nein

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

☐
Yes
Ja

☐
No
Nein

(Number)
(Nummer)

(Country)
(Land)

(Day Month Year Filed)
(Tag Monat Jahr eingereicht)

☐
Yes
Ja

☐
No
Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

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PCT/DE00/00761

10.03.2000

anhängig

pending

(Application Serial No.)
(Anmeldeseriennummer)

(Filing Date D, M, Y)
(Anmeldedatum T, M, J)

(Status)
(patentiert, anhängig,
aufgegeben)

(Status)
(patented, pending,
abandoned)

(Application Serial No.)
(Anmeldeseriennummer)

(Filing Date D,M,Y)
(Anmeldedatum T, M; J)

(Status)
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aufgeben)

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(patented, pending,
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Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: (Name und Registrationsnummer anführen)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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And I hereby appoint

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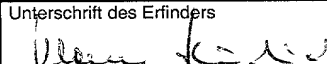
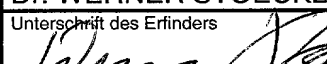
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Unterschrift des Erfinders	Datum	Inventor's signature	Date
	5.7.01		
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Unterschrift des Erfinders	Datum	Second Inventor's signature	Date
	7.7.01		
Wohnsitz		Residence	
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Staatsangehörigkeit		Citizenship	
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Postanschrift		Post Office Address	
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(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).